

Indicator: Toxic Chemicals in Production-Related Wastes Released, Treated, Recycled, or Recovered for Energy Use (338)

Toxic chemicals are contained in waste materials produced by a wide variety of industrial activities, in both public (e.g., sewage treatment plants) and private facilities. These chemical “wastes” are really a composite matrix of various chemicals- some of which may be “hazardous” or “toxic”, and therefore subject to reporting under the Toxic Release Inventory (TRI) program. Some of these chemicals are released on-site or off-site to air, water, or land (including ponds and deep water injection wells). The rest are treated, recycled, or burned to produce energy. Reductions in the quantities of TRI chemicals are desirable from both environmental and economic perspectives. TRI chemicals have known toxic properties rendering them potentially hazardous to workers in both production and waste management as well as to ecosystems systems and human health. As elements of overall business strategies, companies target waste reduction in ways that reduce costs and increase profits.

This indicator tracks trends in the amounts of “production-related wastes” that contain reported TRI chemicals which are either released to the environment, or are treated, recycled, or used for energy recovery. “Non-production related waste”, such as might be associated with catastrophic events and remedial actions (clean-up) are not included in this indicator, because they are not directly related to routine production practices.

The TRI contains information on more than 650 chemicals and chemical categories from nine industry sectors, including manufacturing operations, certain service businesses, and federal facilities. Facilities are required to report to TRI if they employ 10 or more employees, have a TRI covered code (using the North American Industrial Classification System code), and manufacture or process more than 25,000 pounds or otherwise use more than 10,000 pounds of the 650 listed chemicals during a calendar year. Facilities that manufacture, process, or otherwise use Persistent Bioaccumulative and Toxic (PBT) chemicals have lower reporting thresholds, which were established in 2000 and 2001, making the comparison with earlier data sets difficult.

TRI is national in coverage, including all U.S territories. Because the reporting requirements for TRI have varied somewhat between 1998 and 2002 (the most recent year for which annual data reports are available in TRI), only chemicals that were reported consistently from year to year are included in this indicator. A key categories of chemicals in wastes omitted in this analysis include PBT chemicals (due to the above-noted changes in PBT chemicals' reporting thresholds). Metal mining sector land releases are analyzed separately due to a 2003 court decision that significantly altered the scope of TRI reporting of these quantities.

What the Data Show (these data will be updated prior to the publication of the ROE)

In 2002 the quantities of TRI chemicals associated with production-related wastes tracked in this indicator totaled 23.8 billion pounds, a decrease of more than 1 billion pounds (4.5%) since 1998 (Figure 338.1). The decrease was gradual over time with the exception of the year 2000, which saw an increase of 4.9 billion pounds from the previous year, followed by a return to prior levels and reduction trends in 2001. The 2000 increase maybe attributed to a few facilities that reported significant amounts of on-site treatment and on-site recycling (see <http://www.epa.gov/tri/tridata/tri00/index.htm>).

Of the 23.8 billion pounds of TRI chemicals in production-related wasted reported for 2002, 3.38 billion pounds (14.2%) were disposed of on land (on- or off-site) or were released on-site to air, land or water. The remaining 20.44 billion pounds (85.7%) were managed (on- or off-site) through treatment, recycling and energy recovery processes (Figure 338-1).

The 3.38 billion pounds of environmental releases and off-site transfers in 2002 were 10.1% less than the amount reported in 1998, despite a 180 million pound increase in 2002 from 2001. The 20.44 billion pounds otherwise managed in 2002, however, represent only a 3.4% decline from 1998. The ratio of environmental releases to other waste management amounts remained relatively constant from 1988 through 2002, except in 2000 when total production wastes increased by 19.8%.

There were distinct environmental media-specific trends, as well as an off-site transfer trends. Air releases declined steadily over the five years by 21.9% (460 million pounds) from 1998 to 2002. Releases to surface waters dropped 9.5% (20 million pounds) since 1998, after increasing in 1999 by 15 million pounds (the 39 million pound reduction since 1999 is 14.5%). Land releases actually increased by 20 million pounds (1.6%), if metal mining land releases are excluded (Figure 338-2) but showed significant year to year variability (ranging from -18.8% to +23.8% over the four-year period). Off-site transfers, which can't be apportioned by media in TRI, rose steadily by 22.9% (90 million pounds) over the period.

Virtually all of the amounts of production-related wastes released to the environment reported by the metal mining sectors were releases to land. As figure 338.2 illustrates, total production-related wastes released was approximately 11.7 billion pounds over a five year period, compared to 17.8 billion pounds reported by all other industry sectors. The metal mining industry accounted for 65% of the total production-related wastes released to the environment, with the majority of production-related wastes managed by metal mining facilities impacting land. As the graph shows, there is a substantial downward trend for the quantities of total releases reported by the metal mining sector from 2001 to 2002. In 2001, the metal mining industry reported approximately 2 billion pounds in total releases and in 2002, only 1 billion was reported. This overall decrease may be attributed to the court decision of *Barrick Goldstrike Mines v EPA*.

There are less dramatic trends among treatment, energy recovery, and recycling over the period. The amount of TRI chemicals reported as treated in 2002 declined by 480 million pounds (5.8%) from 1998, but were also the source of much of the large increase observed in 2000, when treatment quantities increased by 3.8 billion pounds (42.2%). That increase was more than offset by a 4.4 billion pound decrease 2001 and another 565 million pound decrease in 2002. Recycling quantities also declined from 1998 to 2002, though by smaller amounts in absolute and relative terms (300 million pounds; 3.3%). Recycling quantities also experienced a significant increase in 2000 (960 million pounds; 11.2%), but that increase was not fully offset by the 720 million pound decrease in 2001, which was followed by a 110 million pound increase in 2002. Quantities managed through energy recovery processes fluctuated by approximately 200 million pounds from year to year, with a net change of only a 1.5% increase over the five year period. Some of the year to year fluctuations may reflect changes in aggregate production levels in the national economy.

There was a substantial downward trend for total releases reported by the metal mining sector from 2001 to 2002 (figure 338.2). This overall decrease may be attributed to the court decision of *Barrick Goldstrike Mines v EPA*. Virtually all of the production-related wastes released to the environment reported by the metal mining sectors were releases to land.

Indicator Limitations

- Wastes from facilities and industries within industrial categories that are not required to report to TRI, and small facilities with fewer than ten employees or that manufactured or processed less than the threshold amounts of chemicals are not included in this indicator.
- TRI chemicals vary widely in toxicity, so some low-volume releases of highly toxic chemicals might actually pose higher risks than high-volume releases of less toxic chemicals. The release or disposal of chemicals also does not necessarily result in the exposure of people or ecosystems.

- Lead compounds are not included in the indicator because of a significant change in the reporting threshold in 2001. Vanadium releases were measured beginning in 2001; because the overall amounts were small relative to the other wastes, they are included in the 2001 and 2002 data.
- EPA has published two rules that lowered the TRI reporting thresholds for certain persistent bioaccumulative toxic (PBT) chemicals and added certain other PBT chemicals to the TRI list of toxic chemicals. These PBT chemicals are of particular concern not only because they are toxic but also because they remain in the environment for long periods of time, are not readily destroyed, and build up or accumulate in body tissue. Because of these rules the reporting requirements for these chemicals listed at 40 CFR Section 372.28 have changed since 1998, and therefore, have not been included in the trends provided in this indicator.
- National trends in wastes released to the environment are frequently heavily influenced by a dozen or so large facilities in any particular reporting category, and may not reflect the broader trends in the 2500 smaller facilities that report to TRI each year.

Data Sources

2002 Toxic Release Inventory, Public Data Release Report. EPA 260-R-04-003. Environmental Protection Agency, Toxics Release Inventory Program Division, Office of Information Analysis and Access. Released June 2004. <http://www.epa.gov/tri/tridata/tri02/pdr/index.htm>

2002 Toxic Release Inventory, TRI Press Materials Data Charts and Tables. Environmental Protection Agency, Toxics Release Inventory Program Division, Office of Information Analysis and Access. <http://www.epa.gov/tri/tridata/tri02/press/press.htm>

2002 Toxic Release Inventory, The Toxics Release Inventory (TRI) and Factors to Consider When Using TRI Data. Environmental Protection Agency, Toxics Release Inventory Program Division, Office of Information Analysis and Access. <http://www.epa.gov/tri/FactorsToConPDF.pdf>

<http://www.epa.gov/triexplorer/>, accessed August 2, 2004.

Graphics

Figure 338.1 Wastes Quantities of All Chemicals Except PBT Chemicals Reported by All Industry Sectors from 1998-2002

(Excludes PBT Chemicals; Non-Production Related Waste¹; and, from Land Releases, the Metal Mining Sector²)

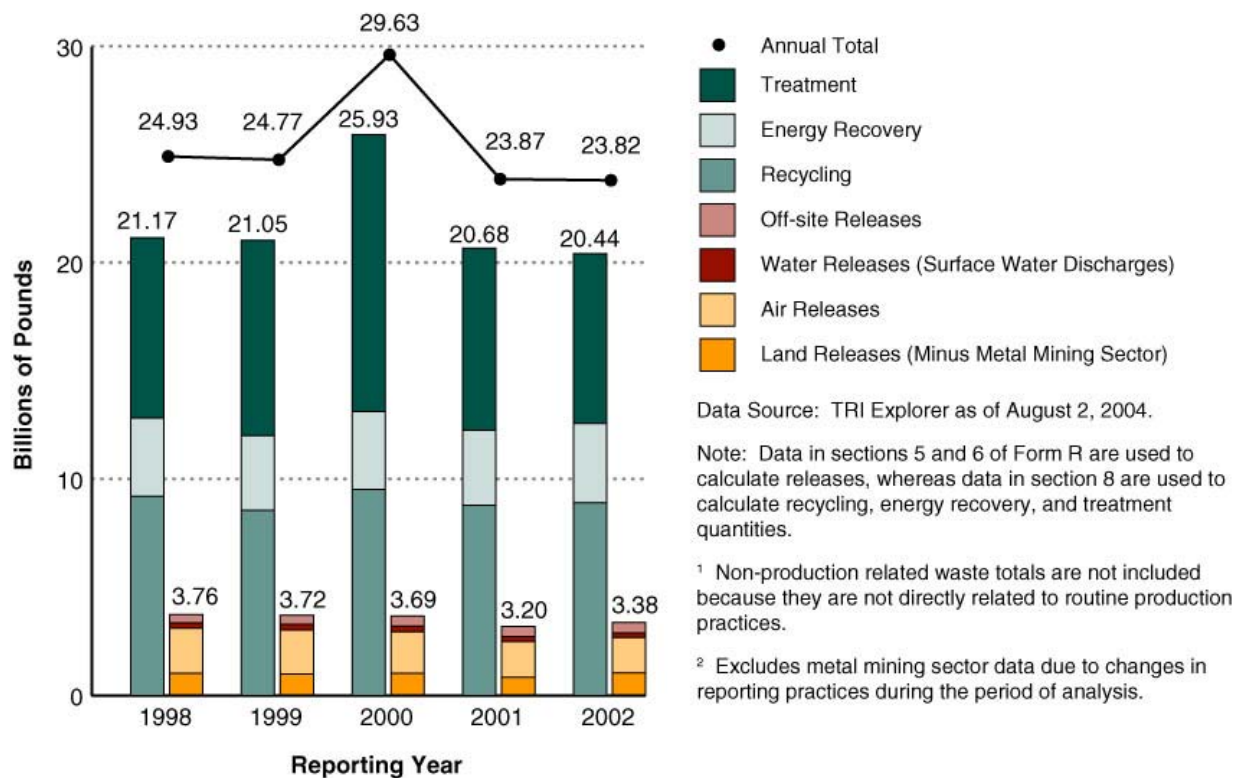
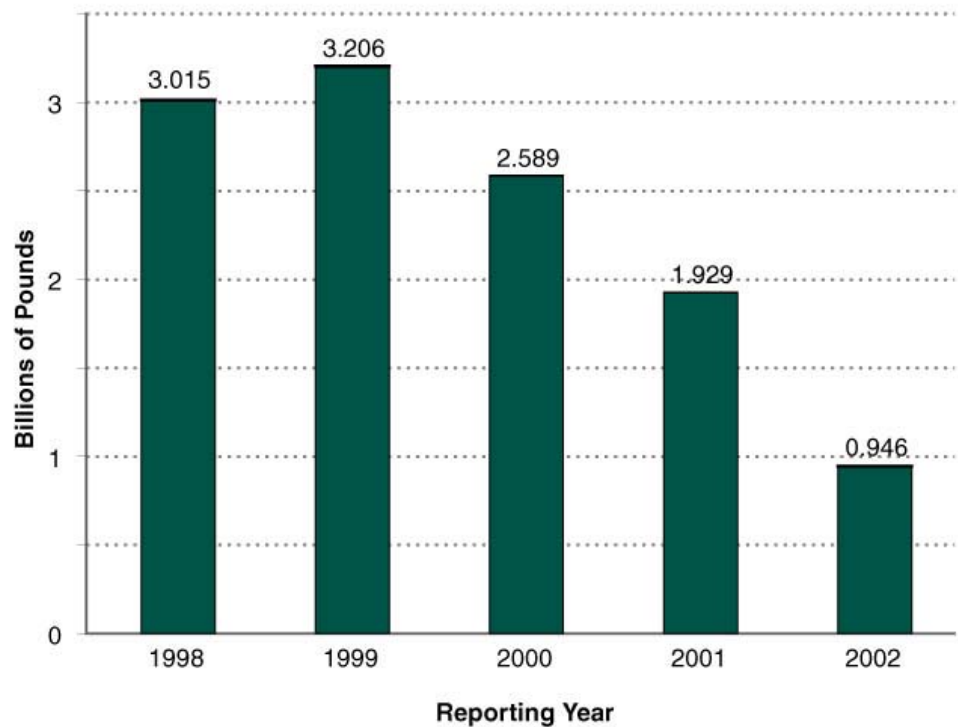


Figure 338.2 Waste Release Quantities for all Chemicals Except PBT Chemicals Reported by the Metal Mining Sector from 1998-2002

Data Source:
TRI Explorer as of
August 2, 2004.

Notes:

- » Some waste quantities may be double counted when waste has been transferred from one TRI facility (which has counted waste as off-site disposal or other releases) to another TRI facility (which has counted transferred waste as on-site disposal or releases to air, land, or water).
- » Data in sections 5 and 6 of Form R are used to calculate releases.
- » Excludes PBT chemicals.



Off-Site Release	0.001	0.002	0.001	0.001	0.001
Water Releases (Surface Water Discharges)	0.001	0.000	0.000	0.000	0.000
Air Releases	0.005	0.004	0.003	0.003	0.002
Land Releases	3.009	3.199	2.585	1.925	0.943
Total	3.015	3.206	2.589	1.929	0.946

R.O.E. Indicator QA/QC

Data Set Name: REPORTED TOXIC CHEMICALS IN WASTES RELEASED, TREATED, RECYCLED, OR RECOVERED FOR ENERGY USE

Indicator Number: 338 (89183)

Data Set Source: U.S.TRI

Data Collection Date: 1998-2002

Data Collection Frequency: 1 Year

Data Set Description: Reported Toxic Chemicals in Wastes Released, Treated, Recycled, or Recovered for Energy Use

Primary ROE Question: What are the trends in chemicals used on the land and their effects on human health and the environment? (Chemicals to include toxic substances, pesticides, fertilizers, etc.)

Question/Response

T1Q1 Are the physical, chemical, or biological measurements upon which this indicator is based widely accepted as scientifically and technically valid?

EPCRA does not allow EPA to prescribe a specific release estimation method that facilities must use to calculate release and other waste management quantities of toxic chemicals for TRI reporting purposes. Instead, a facility may use readily available data (including monitoring data) collected pursuant to other provisions of law, or, where such data are not readily available, reasonable estimates of the amounts involved. EPA recommends that facilities use one or more of four techniques: direct monitoring; emission factors; mass balance; and engineering calculations. Facilities have the flexibility to decide if engineering calculations or some other estimation technique would more accurately represent facility activities. In addition, to assist facilities in understanding the TRI reporting requirements and calculating accurate release and other waste management information, EPA provides more than 20 guidance documents (industry-specific, chemical-specific, and general) http://www.epa.gov/tri/guide_docs/index.htm

T1Q2 Is the sampling design and/or monitoring plan used to collect the data over time and space based on sound scientific principles?

Annual TRI reporting is required by law for all facilities meeting the reporting criteria, so the data represent a census of all covered facilities. The monitoring plan varies among plants, depending on whether they use direct monitoring; emission factors; mass balance; and engineering calculations. EPA guidance documents are provided to ensure that the resulting data are as technically sound as feasible.

T1Q3 Is the conceptual model used to transform these measurements into an indicator widely accepted as a scientifically sound representation of the phenomenon it indicates?

The conceptual model is simple. The total waste from all facilities required to report are summed to provide annual totals by pollutant and release and other waste management categories.

T2Q1 To what extent is the indicator sampling design and monitoring plan appropriate for answering the relevant question in the ROE?

The TRI program covers the entire United States, including Alaska, Hawaii, Puerto Rico and the Virgin Islands. Almost 25,000 facilities located across the entire United States report their annual release and other waste management activities on more than 650 toxic chemicals and chemical categories to the TRI program. The data cover the entire calendar year. The TRI does not cover releases and other waste management from facilities not required to report. The types (SIC codes)

of facilities that must report and the reporting thresholds for some toxic chemicals have changed over time, so it is important that the indicator include only trends that are comparable over time.

T2Q2 To what extent does the sampling design represent sensitive populations or ecosystems?

Reporting is required for all facilities that meet the reporting criteria, without regard to the sensitivity of receptor populations.

T2Q3 Are there established reference points, thresholds or ranges of values for this indicator that unambiguously reflect the state of the environment?

The nature of the release, and the form, transport, and transformation of pollutants in the environment all affect the impact of the releases on ambient concentrations, exposures, and effects of the pollutants.

T3Q1 What documentation clearly and completely describes the underlying sampling and analytical procedures used?

The procedures can be found at: <http://www.epa.gov/tri>

T3Q2 Is the complete data set accessible, including metadata, data-dictionaries and embedded definitions or are there confidentiality issues that may limit accessibility to the complete data set?

Complete data from all parts of the reporting are available on Envirofacts <http://www.epa.gov/enviro>, and data on on-site releases and off-site waste management are available using TRI Explorer <http://www.epa.gov/triexplorer>. Reporting forms and an Instruction manual that explains each data element on the forms can be found at http://www.epa.gov/tri/guide_docs/index.htm. Confidentiality issues do not seriously affect data availability - the TRI Program receives less than 5 trade secret claims each year for all of 95,000 reporting forms submitted by almost 25,000 facilities each year. Trade secret claims made under the TRI Program do not relieve facilities of their obligation to submit release and other waste management data. Instead, trade secret claims merely allow the submitter to mask the specific toxic chemical identity with a generic name that must be structurally descriptive of the chemical claimed a trade secret.

T3Q3 Are the descriptions of the study or survey design clear, complete and sufficient to enable the study or survey to be reproduced?

Yes, all of the compliance assistance materials (guidance documents, etc.), are available at http://www.epa.gov/tri/guide_docs/index.htm.

T3Q4 To what extent are the procedures for quality assurance and quality control of the data documented and accessible?

The TRI Program has implemented a number of data collection and validation protocols, including sound collection methodologies, data management systems, and quality assurance procedures to help ensure that the TRI reporting requirements are correctly applied on a consistent basis. Specifically, EPA provides the following assistance and data quality checks: - over 20 guidance documents (industry-specific, chemical-specific, and general); - over 50 annual workshops, including Web-based sessions; - an interactive, intelligent, and user-friendly software, known as the Toxics Release Inventory Made Easy (TRI-ME) software that walks reporters through the compliance determinations and assists in completing the reporting forms, and runs a series of validation checks on the data before allowing submission to the Agency on paper,

diskette, or over the Internet via the Agency's Central Data Exchange (CDX); - Facility Data Profiles that allow facilities to review the data submitted to the TRI Program; - the identification of data outliers through an analysis of the data; - data quality calls that alert facilities with potential data quality issues to check their data; - periodic site visits and the inspection of facilities for data quality and reporting violations; and - a formal data withdrawal and revision process to update the database with the best available information. See http://www.epa.gov/tri/guide_docs/index.htm. Facilities must certify that the data submitted is true and complete and that the amounts and values are accurate based on reasonable estimates using data available to the preparers of the report. Data quality reports are available for 1994, 1995, and 1996 data: http://www.epa.gov/tri/tridata/data_quality_reports/index.htm

T4Q1 Have appropriate statistical methods been used to generalize or portray data beyond the time or spatial locations where measurements were made (e.g., statistical survey inference, no generalization is possible)?

Because TRI collects actual data, there is no need to use statistics or generalizations to portray data beyond the time or spatial locations where measurements were made.

T4Q2 Are uncertainty measurements or estimates available for the indicator and/or the underlying data set?

No.

T4Q3 Do the uncertainty and variability impact the conclusions that can be inferred from the data and the utility of the indicator?

Variability in the facilities that report and the thresholds for reporting must be taken into account when looking at long-term trends. Facilities can also move into and out of SIC codes required to report due to inter-annual variability in their product streams. Because trend analysis is conducted over a number of years the Program has some insight into whether there is consistent application of the reporting requirements over time.

T4Q4 Are there limitations, or gaps in the data that may mislead a user about fundamental trends in the indicator over space or time period for which data are available?

Potential gaps include the classes of facilities required to report, releases below the reporting thresholds, and toxic chemicals not included in the reporting requirements.